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ENGINEERING EVALUATION / FACT SHEET

BACKGROUND INFORMATION

Application No.:	R13-2005C
Plant ID No.:	011-00062
Applicant:	Earthgrains Baking Companies, Inc.
Facility Name:	Huntington
Location:	Huntington, Cabell County
NAICS Code:	311812
Application Type:	Modification
Received Date:	November 30, 2010
Engineer Assigned:	Laura Jennings
Fee Amount:	$1,000.00
Date Received:	December 2, 2010
Complete Date:	December 30, 2010
Due Date:	March 29, 2010
Applicant Ad Date:	December 7, 2010
Newspaper:	*The Herald-Dispatch*
UTM's:	Easting: 371km Northing: 4252 km Zone: 17
Description:	Correction of the capacity of the 18 Tray Baker Perkins 970 Oven and correction of the heat input capacities for all three ovens at the site.

DESCRIPTION OF PROCESS

The emission units at the bakery are separated into two categories - significant emission units and insignificant emission units. The insignificant units are identified as such in accordance with the insignificant activities list provided by the WV DEP. Each emission unit and associated maximum design rates are presented in the table below.

Emission Units:

Emission Unit ID	Emission Point ID	Description of Unit	Maximum Design Rate
1S	1E, 2E, 3E	58 Tray Baker Perkins 970 Oven	**5.940 MM Btu/hr** 15,000 lb bread/hr (limited to 39,000tpy)

2S	4E, 5E, 6E	38 Tray Teledyne Readco Oven	**5.390 MM Btu/hr** 7,200 lb buns/hr (limited to 18,720 tpy)
3S	7E, 8E	18 Tray Baker Perkins 970 Oven	**1.980 MMBtu/hr** **4,255 lb buns/hr** (limited to 7,800 tpy)
4S	9E	Flour Handling System	39,000 tons/year (limited)
5S	10E	Ink Jet Printing	
6S	11E	Kohler Emergency Generator	350 kW
7S	12E	Caterpillar Emergency Generator	260 kW
Insignificant		Boiler No. 1 (Hurst)	5.02 MM Btu/hr
Insignificant		Boiler No. 2 (Kewanee)	4.2 MM Btu/hr
Insignificant		Storage Tank	4,000 gallon diesel UST
Insignificant		Solvent Parts Washer	
Insignificant		Water Heaters	<300,000 Btu/hr
Insignificant		Water Heater	3.0 MM Btu/hr

The general process involves receipt of ingredients (including flour), mixing of ingredients to produce dough, shaping and dividing the dough, proofing the dough pieces under humidified conditions using stream from the boilers, baking the product in the ovens, cooling the product and packaging the product for distribution to the customer. Two 10,000 gallon USTs (gasoline and diesel) previously listed as insignificant activities were removed from the bakery in September 2010.

Description of Modification:

During the Title V renewal process, Earthgrains reevaluated the capacity of each of the ovens and the maximum heat input for each. The values noted in bold in Table G-1 have been updated from the previously submitted information. As part of this modification, Earthgrains would like to update the hourly heat input capacity for all three ovens (1S, 2S, and 3S). Additionally, the maximum baking capacity for the 18 Tray Baker Perkins 970 Oven (3S) should be updated from 3,000 lb/hr to 4,255 lb/hr.

None of these changes will require modification of the maximum annual production rates or natural gas usage rates. Earthgrains is requesting that the maximum hourly production rate for Unit ID No. 3S be increased, along with the maximum hourly emission rate from this unit. Also, the maximum natural gas combustion rates for each oven should also be adjusted.

Earghrains has also updated the Review of Reasonably Available Control Technology (RACT) to account for the adjustment in the maximum production rate.

Emission Units Table:

Emission Unit ID	Emission Point ID	Emission Unit Description	Year Installed / Modified	Design Capacity	Type and Date of Change	Control Device
1S	1E	58 Tray Baker Perkins 970 Oven	1992 / 2001	15,000 lb/hr	Corrected, 11/2010	NA
1S	2E					
1S	3E					
2S	4E	38 Tray Teledyne Readco Oven	1974	7,200 lb/hr	Corrected, 11/2010	NA
2S	5E					
2S	6E					
3S	7E	18 Tray Baker Perkins 970 Oven	2001	4,255 lb/hr	Corrected, 11/2010	NA
3S	8E					
4S	9E	Flour Handling System	1986	39,000 tpy	NA	1C
5S	10E	Ink Jet Printing			NA	NA
6S	11E	Kohler Emergency Generator	1991	350 kW	NA	NA
7S	12E	Caterpillar Emergency Generator	Mid 1970s	260 kW	NA	NA

SITE INSPECTION

A site inspection was performed by the writer on Wednesday March 16, 2011. Participants from Earthgrains Baking included Jeff Barrett (Chief Engineer), Christopher Wolfe (East Region Manager for Safety and Environmental), Paul White (operations), and Chris Smith (local environmental). A tour of the facility and process was provided and included a review of the ovens involved with this modification application. There were no concerns as a result of the site inspection relating to this application.

ESTIMATE OF EMISSIONS

VOC Emissions from Yeast Fermentation:

Ethanol is produced in the bread baking process.

1 Sugar + Water + Yeast ➜ 4 Ethanol + Carbon Dioxide

Stack testing performed on the bakery ovens during 1994 and 1995 yielded an emission factor for the bread oven of 3.053 lb VOC/1,000 lb bread baked (6.106 lb/ton). Similarly, the emission factor for bun baking in the Earthgrains ovens was 3.437 lb VOC/1,000 lb bun baked (6.874 lb/ton). The maximum potential emissions from each oven are calculated below based on the maximum hourly throughput of the ovens and the limits imposed in the permit for the site to comply with 45CSR21 RACT requirements.

As an example, the potential to emit for Bread Oven [1S] is calculated below:

(39,000 tons bread/yr) x (6.106 lbs VOC/ton bread) x (1ton VOC/2000 lb VOC) = 119.1 ton VOC/year

Since the bakery exceeded the hourly limits on the Baker Perkins Bun Oven [3S] during 2009, the maximum throughput of each oven was reevaluated and updated in this application. The hourly emissions limits for the ovens had been based on the maximum throughput and the stack testing factors, which should not have been exceeded. Earthgrains requests that the hourly limits for each oven be updated in the new permit to match the updated maximum throughput values. The annual limits for each oven should remain unchanged.

N.1 Potential VOC emissions from fermentation for each emission unit:

Emission Unit	VOC Emission Factor	Maximum Throughput	Limited Throughput	Potential VOC Emissions	Potential VOC Emissions (with annual throughput limitation)
	(lb VOC/ ton product)	(tons/hr)	(tons/yr)	(Lb/hr)	(tons/yr)
1S BP Bread Oven	6.106	7.50	39,000	45.8	119.1
2S TR Bun Oven	6.874	3.60	18,720	24.7	64.4
3S BP Bun Oven	6.874	2.13	7,800	14.6	26.8

The writer has reviewed and verified the submitted emissions calculations. The emission factor that was used in the calculations based on results of stack testing was also reviewed

against modeled AP-42 emission factors and were found to be of similar magnitude. The emission factors used by Earthrains is of course more accurate because they are based on the actual ovens and conditions at the facility.

Emission Calculations for Combustion of Natural Gas:

The maximum amount of fuel used in each of the combustion units was calculated by using the maximum design heat input rating for each unit and by assuming that the total amount of natural gas used at the facility was used in the listed units. The calculated fuel usage numbers are listed in table N.2. The maximum hourly design rate (MDHR) is calculated based on the maximum design heat input rating for each oven and boiler, and AP-42 default heating values of natural gas (1,020 BTU/scf). Potential emissions from combustion of the emission units are based on the MDHR multiplied by the emission factors for the fuel, from AP-42, Section 1.4.

N.2 Maximum Design Rate for Each Bakery Oven:

Emission Unit	Maximum Design Heat Input Rating	Maximum Natural Gas Design Rate	Limited Gas Usage Rate
	(MMBtu/hr)	(MMCF/hr)	(MMCF/yr)
1S BP Bread Oven	5.940	0.005940	52
2S TR Bun Oven	5.390	00.005390	39.5
3S BP Bun Oven	1.980	0.001980	9.4

As an example, the maximum natural gas design rate for the Bread Oven is:

(5.940 MMBtu/hr) x (1 MMCF/1000 MMBtu) = 0.005940 MMCF/hr

N.3 Summary of Combustion Emissions from Natural Gas:

Pollutant	Emission Factor	Potential Emissions					
	(Lb/MMCF)	BP Bread Oven [1S]		TR Bun Oven [2S]		BP Bun Oven [3S]	
		lb/hr	tpy	lb/hr	tpy	lb/hr	tpy
PM_{10}	7.6	0.05	0.20	0.05	0.15	0.02	0.04
NO_X	100	0.60	2.60	0.53	1.98	0.20	0.47
SO_2	0.6	0.01	0.02	0.01	0.02	0.01	0.01
CO	84	0.50	2.19	0.45	1.67	0.17	0.40
VOC	5.5	*ST	*ST	*ST	*ST	*ST	*ST

*ST - included in stack test results

As an example, the maximum potential NOx emissions for natural gas combustion in the bread oven are equal to:

(52 MMCF/yr) x (100 lbs Nox/MMCF) x (0.0005 tons Nox/lb NOx) = 2.60 tons Nox/yr

All other pollutant actual and potential emissions are calculated in a similar manner. Negligible or trace amounts of HAPs may result from the combustion of natural gas. Based on emission rates published AP-42, Section 1.4, the approximate emission rate for formaldehyde is 0.0000735 lb/MMBTU. Per AP-42, formaldehyde is the most prevalent HAP generated from the combustion of natural gas. Emission calculations resulting from the combustion of natural gas were also reviewed and verified by the writer.

Summary of Air Emissions Calculations:

The total emissions shown in Table N-4 below reflect the VOC emissions as a result of the fermentation in addition to the combustion emissions.

Emissions Summary Table N-4

Emission Pt. ID	Emission Unit ID	Control Device ID	Regulated Pollutant	Maximum Potential Controlled Emissions	
				lb/hr	tpy
1E, 2E, 3E	1S	Throughput Limitation*	PM_{10}	0.05	0.20
			NO_X	0.60	2.60
			SO_2	0.01	0.02
			CO	0.50	2.19
			VOC	45.8	119.1
4E, 5E, 6E	2S	Throughput Limitation*	PM_{10}	0.05	0.15
			NO_X	0.53	1.98
			SO_2	0.01	0.02
			CO	0.45	1.67
			VOC	24.8	64.4
7E, 8E	3S	Throughput Limitation*	PM_{10}	0.02	0.04
			NO_X	0.20	0.47
			SO_2	0.01	0.01
			CO	0.17	0.40
			VOC	14.6	26.8

Total	PM_{10}	0.12	0.39
	NO_X	1.34	5.05
	SO_2	0.03	0.03
	CO	1.12	4.23
	VOC	85.2	210.3

TL* - the control is the annual throughput limitation of either the natural gas usage and/or the annual production. There is no change to the annual throughput limitation with this modification application.

Emission Changes for [1S], [2S], and [3S] from R13-2005B

Regulated Pollutant	Maximum Potential Controlled Emissions	
	lb/hr	tpy
PM_{10}	+0.07	+0.29
NO_X	-0.60	0
SO_2	0	0
CO	-0.52	0
VOC	+4.3	0

REGULATORY APPLICABILITY

State Regulations:

45CSR7 TO PREVENT AND CONTROL PARTICULATE MATTER AIR POLLUTION FROM MANUFACTURING PROCESSES AND ASSOCIATED OPERATIONS

The permittee continues to be subject to 45CSR7. The baking ovens meet the definition of the type “a” operation according to 45CSR7-2.39.a., any manufacturing process involving glass melting, calcination or physical change. The conversion of dough to bread or buns is a physical change.

The maximum production rate of the three ovens combined is 26,455 lbs/hr. The maximum allowable total emission rate for type “a” operation is 10.3 lb/hr of total particulate matter. Total particulate matter emissions from the three ovens [1S, 2S, and 3S] are 0.11 lb/hr as calculated with the corrected heating capacities.

The applicant meets the limitation standard of 45CSR7-4.1.

To be consistent with the latest Title V permit R30-01100062-2010,

references to 45CSR7-4.1, 45CSR7-3.1 and 45CSR7-8.1 were removed from the permit because the flour handling system was determined not to meet the definition of a "source operation type" in 45CSR7-2.39 in the Title V Fact Sheet R30-01100062-2010.

45CSR10 TO PREVENT AND CONTROL AIR POLLUTION FROM THE EMISSIONS OF SULFUR OXIDES

Based on the revised capacities of the baking ovens [1S, 2S, and 3S], the Sulfur Dioxide emissions are 0.03 lbs/hr and 0.04 tpy or 80 lbs/yr . The baking ovens are considered "process heaters" according to the definition in 45CSR10-2.18.

The permittee is exempt from 45CSR10 because the potential to emit sulfur oxides is less than 500 pounds per year. [45CSR10-4.1.e]

45CSR13 PERMITS FOR CONSTRUCTION, MODIFICATION, RELOCATION AND OPERATION OF STATIONARY SOURCES OF AIR POLLUTANTS, NOTIFICATION REQUIREMENTS, ADMINISTRATIVE UPDATES, TEMPORARY PERMITS, GENERAL PERMITS, PERMISSION TO COMMENCE CONSTRUCTION, AND PROCEDURES FOR EVALUATION

The permittee meets the requirements of 45CSR13. They submitted a modification application because the application involved a review of reasonably available control technology (RACT). Although the change in emissions would typically meet the definition of a Class II administrative update, under section 4.1.a of 45CSR13, at the Secretary's discretion a determination may be made that an applicant is not eligible for an administrative update. Review of RACT for 45CSR21 compliance is considered a substantive requirement and therefore, the applicant submitted the application as a modification.

45CSR21 REGULATION TO PREVENT AND CONTROL AIR POLLUTION FROM THE EMISSION OF VOLATILE ORGANIC COMPOUNDS

The applicant requests as part of the modification application to increase the maximum baking capacity for the 18 Tray Baker Perkins 970 Oven [3S] from 3,000 lb/hr to 4,255 lb/hr. There is no change requested for the annual VOC emissions that are currently controlled by annual production limitations. The VOC emissions in the table below are calculated at the increased capacity for oven 3S.

VOC Emissions:

Emission Pt. ID	Emission Unit ID	Maximum Potential Uncontrolled Emissions		Maximum Potential Controlled Emissions	
		lb/hr	tpy	lb/hr	tpy
1E, 2E, 3E	1S	45.8	200.6	45.8	119.1
4E, 5E, 6E	2S	24.8	108.4	24.8	64.4
7E, 8E	3S	14.6	64.1	14.6	26.8
	Total	85.2	373.1	85.2	210.3

The applicant is subject to 45CSR21, Section 40 and has provided a review of reasonably available control technology (RACT) for the increase in emissions of VOCs associated with this permit modification application. The RACT evaluation identifies emission control options and determines the technical practicability, economic reasonableness and environmental impacts of reducing VOC emissions due to these changes.

The applicant has identified potential emission control technologies by researching the technical literature, USEPA guidance documents, control equipment vendor information and utilizing process knowledge and engineering experience. The RACT/BACT/LAER Clearinghouse (RBLC) database, maintained by the USEPA, contains a list of technologies that have been approved as BACT/LAER in issued permits. A search of the RBLC database was conducted to identify the emission control technologies and emission levels that have been approved by permitting authorities recently and in the past. The application also reviewed the Alternative Control Technology Document for Bakery Oven Emissions[1] for appropriate control technologies. A search of potential vendors was conducted to identify any new or emerging control technologies applicable to bakery ovens.

The potential control technologies are: Regenerative or recuperative thermal oxidizers; Catalytic oxidizers; Carbon adsorption systems; Scrubbers; Condensation systems; and Biofiltration. Due to the nature of the bakery's activities, the facility cannot make formula or ingredient changes to reduce VOC emissions. Changes in the formula components or ingredients affect the characteristics of the product upon which Sara Lee sells its product. This type of change, therefore, will not be considered in this BACT evaluation.

Several of the potential control technologies are not technically appropriate for a bakery oven application. The following technically infeasible control

technologies are eliminated from further consideration: Carbon Adsorption systems, Scrubbers, Condenser systems, and Biofiltration.

The remaining control technologies include thermal oxidation (RTO) and catalytic oxidation. According to available literature, there is only a small difference between the design removal efficiency for a regenerative thermal oxidizer and a catalytic oxidizer. The efficiency is dependent upon the VOC concentration in the exhaust stream entering the oxidizer. Catalytic oxidation is the VOC control choice by more than 90% of bakers in the US for VOC emissions from bakery ovens. Sara Lee operates catalytic oxidizers on several bakeries and has performed a cost effectiveness determination for a catalytic oxidizer as the preferred type of unit for the bakery application.

The cost evaluation was performed using the methodology contained in the USEPA guidance document, "OAQPS Control Cost Manual", projected emission calculations for the bagel oven and vendor information for the control device. A summary of the evaluation for a catalytic oxidizer achieving at least 95% control efficiency is provided in the table below.

Cost Evaluation for Catalytic Oxidizer:

Annualized Cost	Actual Projected VOC Emission Reduction (ton/yr)	Cost Effectiveness for Actual Projected VOC Emissions ($/ton VOC removed)
$279,070	25.5	$10,961

The cost evaluation indicates that the installation of the best available control option on the 3S bun oven to reduce VOC emissions would cost Sara Lee approximately $10,961/ton of VOC removed. The applicant has stated that this cost is prohibitive to the bun oven's continued operation and that the installation of a catalytic oxidizer on the bun oven for a slight reduction in emissions is not cost effective.

The writer agrees with the basis of the RACT evaluation of the 18 Tray Baker Perkins Oven [3S] for this modification because of the increased hourly production throughput requested in this application. There were no requested changes to the other ovens [1S or 2S]

The writer has conducted searches within the RBLC (RACT/ BACT/ LAER) Clearinghouse and after reviewing the information, is satisfied that the information provided in the application reflects the information contained within the U.S. EPA's Technology Transfer Network.

The writer further agrees with the explanation provided in the application

that neither carbon adsorbers nor scrubbers are technically feasible for bakery ovens because it is consistent with the information contained in AP-42, Section 9.9.6 for Bread Baking and the "Alternative Control Technology Document for Bakery Ovens", USEPA, EPA 453/R-92-017, December 1992.

The applicant performed the cost evaluation portion of the RACT analysis using the methodology contained in the USEPA guidance document, "OAQPS Control Cost Manual" the projected emissions calculations for the oven, and vendor information provided to the applicant for the control device. The writer reviewed the "OAQPS Control Cost Manual" and is satisfied that this methodology was followed to conduct the analysis.

The writer therefore agrees with the applicant's conclusion that installation of the best available control option presented for the 3S bun oven to reduce VOC is cost prohibitive to the oven's continued operation. This conclusion is further supported by Figure 4-1 "Cost Effectiveness of Catalytic Oxidation on Baker Ovens" contained within the "Alternative Control Technology Document for Bakery Ovens" that graphically illustrates that the Cost of VOC removal ($/ton) is highest for the lower oven design heat inputs (Btu/hr).

For the reasons stated above, the writer believes that the applicant meets the requirements of "Reasonably available control measures" (RACM). Defined as, an emission limit or limits that reflect the application of control technology and/or abatement techniques or measures that are reasonably available, considering technological and economic feasibility. Such emission limits may be considered on a plant-wide basis to achieve emission reduction requirements in the most cost effective manner. [45CSR21-40.2.a]

TOXICITY OF NON-CRITERIA REGULATED POLLUTANTS

There are no new non-criteria regulated pollutants as a result of this modification application.

AIR QUALITY IMPACT ANALYSIS

No modeling was required to be conducted as a result of this modification application.

MONITORING OF OPERATIONS

No changes were made to the monitoring requirements.

CHANGES TO PERMIT R13-2005B

The applicant requested the following changes:

1. Update the design capacity for Emission Unit ID 3S from 3,000 lb/hr to 4,255 lb/hr.
   Response: Updated

2. Update the total maximum emissions from the facility's baking ovens [1S], [2S], and [3S] as follows:

Regulated Pollutant	R13-2005B		R13-2005C	
	lb/hr	tpy	lb/hr	tpy
CO	1.64	4.23	1.12	4.25
NOx	1.94	5.05	1.34	5.05
PM10	0.05	0.10	0.12	0.39
SO2	0.03	0.03	0.03	0.03
VOCs	80.9	210	85.2	210

   Response: Updated

3. Update the maximum production rates of baked goods from [3S] to 4,255 lb/hr from 3,000 lb/hr and the total to 26,455 lb/hr from 25,200 lb/hr.
   Response: Updated

4. Update the maximum design heat input rating for [1S] from 10.0 MMBtu/hr to 5.94 MMBtu/hr, for [2S] from 7.6 MMBtu/hr to 5.39 MMBtu/hr, and for [3S] from 1.98 MMBtu/hr to 1.8 MMBtu/hr. The maximum natural gas usage rate was not requested to be changed.
   Response: Updated MDHIs as requested

5. Update the amount of natural gas combusted hourly at each oven as follows:

ID No.	Oven	Maximum Gas Useage Rate	
		ft3 /hr	ft3 /hr
		FROM:	TO:
1S	58 Tray Baker Perkins Oven	10,000	5,940
2S	38 Tray Teledyne Readco Oven	7,600	5,390
3S	18 Tray Baker Perkins Oven	1,800	1,980

Total		19,400	13,310.0

Response: Updated

Other changes made by the DAQ:

6. Changed to the current format for this modification application.

7. Removed references to requirements 45CSR7-4.1, 45CSR7-3.1 and 45CSR7-8.1 as explained in the regulations section.

8. Removed requirements for 45CSR10 as explained in the regulations section.

RECOMMENDATION TO DIRECTOR

The writer recommends that modification permit R13-2005C be granted to Earthrains Baking Companies, Inc. and located in Huntington, WV (Cabell County). The basis of the recommendation is that the applicant will be in compliance with all applicable state and federal regulations based on the information provided in the application including any supplemental information provided during the permitting process.

Laura M. Jennings
Permit Engineer

Date